A NOVEL SILANE PRIMER SYSTEM APPROACH FOR RESIN ZIRCONIA BONDING

OBJECTIVE: To investigate the effect of two cross-linking silanes blended with 3-acryloxypropyltrimethoxysilane on the shear bond strength between resin cement and silica-coated zirconia.

MATERIALS AND METHODS: 90 specimens of zirconia (Nobel Biocare) were subjected to silica-coating by Rocatec Plus (3M ESPE, 110 μm) sand at an operation pressure of 280 kPa, for 30 s/cm^2. 3M ESPE Sil-silane (3M ESPE) was used as a control. Primers of 1.0 vol% of 3-acryloxypropyltrimethoxysilane (ACPS), with 0.5 vol% cross-linking silanes bis-1,2-(triethoxysilyl) ethane (BTSE; Gelest) and bis[3-(trimethoxysilyl)propyl] amine (BTMA; ABCR) were prepared in a 95% ethanol and 5% deionised-water solvent mixture. The solutions were applied onto silica-coated zirconia surfaces and allowed to react for 5 min. RelyX resin cement (3M ESPE) was introduced into cylindrical stubs onto the zirconia surface and light-cured for 40 s twice. Half of the specimens were subjected to shear bond strength testing after dry storage and the other half after thermo-cycling for 6000 cycles, in an Instron machine. The silanized surfaces were analyzed with X-ray photoelectron spectroscopy. Data were compared with one-way ANOVA (significance level α=0.05).

RESULT: There was no significant difference in mean shear bond strengths between control silane and ACPS blended with either of the two cross-linking silanes after dry storage ($p>0.13$). However, there was a significant difference in shear bond strengths after thermo-cycling ($p<3.8x10^{-8}$); ACPS+BTMA exhibited the highest shear bond strength (Table 1). Failure mode analysis suggested predominantly adhesive failure.

	Mean shear bond strength±SD / MPa					
Silane	**Dry**	**Thermocycling (6000 cycles)**	**Debonding /%**	**Adhesive /%**	**Mixed %**	**Cohesive /%**
Control	10.3±1.7	10.5±2.4	0	93.3	6.7	0
ACPS+BTSE	11.8±3.5	5.8±2.2	0	53.3	6.7	40.0
ACPS+BTMA	9.8±2.8	13.9±4.2	0	93.3	6.7	0

CONCLUSION: An experimental primer of a combination of an organofunctional silane and a cross-linking-silane may promote superior bonding than the control silane product.